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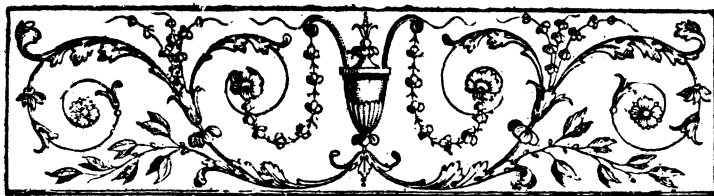
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TRANSACTIONS
OF THE
American PHILOSOPHICAL SOCIETY, &c.

Nº. I.

*Conjectures concerning the formation of the Earth, &c.
in a letter from Dr. B. Franklin, to the Abbé Soularie.*

Passey, September 22, 1782.

S I R,

Read Nov.
21, 1788.

I RETURN the papers with some corrections. I did not find coal mines under the Calcareous rock in Derby Shire. I only remarked that at the lowest part of that rocky mountain which was in sight, there were oyster shells mixed in the stone; and part of the high county of Derby being probably as much above the level of the sea, as the coal mines of Whitehaven were below it, seemed a proof that there had been a great bouleversement in the surface of that Island, some part of it having been depressed under the sea, and other parts which had been under it being raised above it. Such changes in the superficial parts of the globe seemed to me unlikely to happen if the earth were solid to the centre. I therefore imagined that the internal part might be a fluid more dense, and of greater specific gravity than any of the solids we are ac-

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quainted

quainted with; which therefore might swim in or upon that fluid. Thus the surface of the globe would be a shell, capable of being broken and disordered by any violent movements of the fluid on which it rested. And as air has been compressed by art so as to be twice as dense as water, in which case if such air and water could be contained in a strong glass vessel, the air would be seen to take the lowest place, and the water to float above and upon it; and as we know not yet the degree of density to which air may be compressed; and M. Amontons calculated, that its density increasing as it approached the centre in the same proportion as above the surface, it would at the depth of—leagues be heavier than gold, possibly the dense fluid occupying the internal parts of the globe might be air compressed. And as the force of expansion in dense air when heated is in proportion to its density; this central air might afford another agent to move the surface, as well as be of use in keeping alive the subterraneous fires: Though as you observe, the sudden rarefaction of water coming into contact with those fires, may also be an agent sufficiently strong for that purpose, when acting between the incumbent earth and the fluid on which it rests.

If one might indulge imagination in supposing how such a globe was formed, I should conceive, that all the elements in separate particles being originally mixed in confusion and occupying a great space, they would as soon as the almighty fiat ordained gravity or the mutual attraction of certain parts, and the mutual repulsion of other parts to exist, all move towards their common centre: That the air being a fluid whose parts repel each other, though drawn to the common centre by their gravity, would be densest towards the centre, and rarer as more remote; consequently all matters lighter than the central part of that air and immersed in it, would recede from the
centre

centre and rise till they arrived at that region of the air which was of the same specific gravity with themselves, where they would rest; while other matter, mixed with the lighter air would descend, and the two meeting would form the shell of the first earth, leaving the upper atmosphere nearly clear. The original movement of the parts towards their common centre, would naturally form a whirl there; which would continue in the turning of the new formed globe upon its axis, and the greatest diameter of the shell would be in its equator. If by any accident afterwards the axis should be changed, the dense internal fluid by altering its form must burst the shell and throw all its substance into the confusion in which we find it.

I will not trouble you at present with my fancies concerning the manner of forming the rest of our system. Superior beings smile at our theories, and at our presumption in making them. I will just mention that your observation of the ferruginous nature of the lava which is thrown out from the depths of our volcanos, gave me great pleasure. It has long been a supposition of mine that the iron contained in the substance of this globe, has made it capable of becoming as it is a great magnet. That the fluid of magnetism exists perhaps in all space; so that there is a magnetical North and South of the universe as well as of this globe, and that if it were possible for a man to fly from star to star, he might govern his course by the compass. That it was by the power of this general magnetism this globe became a particular magnet. In soft or hot iron the fluid of magnetism is naturally diffused equally; when within the influence of a magnet, it is drawn to one end of the iron, made denser there, and rarer at the other, while the iron continues soft or hot, it is only a temporary magnet: If it cools or grows hard in that situation, it becomes a permanent one, the magnetic fluid not easily resuming its equilibrium. Perhaps it may be owing to the

permanent magnetism of this globe, which it had not at first, that its axis is at present kept parallel to itself, and not liable to the changes it formerly suffered, which occasioned the rupture of its shell, the submersions and emersions of its lands and the confusion of its seasons. The present polar and equatorial diameters differing from each other near ten leagues; it is easy to conceive in case some power should shift the axis gradually, and place it in the present equator, and make the new equator pass through the present poles, what a sinking of the water would happen in the present equatorial regions, and what a rising in the present polar regions; so that vast tracts would be discovered that now are under water, and others covered that now are dry, the water rising and sinking in the different extremes near five leagues.—Such an operation as this, possibly, occasioned much of Europe, and among the rest, this mountain of Passy, on which I live, and which is composed of lime stone, rock and sea shells, to be abandoned by the sea, and to change its ancient climate, which seems to have been a hot one. The globe being now become a permanent magnet, we are perhaps safe from any future change of its axis. But we are still subject to the accidents on the surface which are occasioned by a wave in the internal ponderous fluid; and such a wave is producible by the sudden violent explosion you mention, happening from the junction of water and fire under the earth, which not only lifts the incumbent earth that is over the explosion, but impressing with the same force the fluid under it, creates a wave that may run a thousand leagues lifting and thereby shaking successively all the countries under which it passes. I know not whether I have expressed myself so clearly, as not to get out of your sight in these reveries. If they occasion any new enquiries and produce a better hypothesis, they will not be quite useless. You see I have given a loose to imagination; but I approve much more
your

your method of philosophizing, which proceeds upon actual observation, makes a collection of facts, and concludes no farther than those facts will warrant. In my present circumstances, that mode of studying the nature of this globe is out of my power, and therefore I have permitted myself to wander a little in the wilds of fancy. With greate steem I have the honour to be, &c.

P. S. I have heard that chemists can by their art decompose stone and wood, extracting a considerable quantity of water from the one, and air from the other. It seems natural to conclude from this, that water and air were ingredients in their original composition. For men cannot make new matter of any kind. In the same manner may we not suppose, that when we consume combustibles of all kinds, and produce heat or light, we do not create that heat or light; but only decompose a substance which received it originally as a part of its composition? Heat may thus be considered as originally in a fluid state, but, attracted by organized bodies in their growth, becomes a part of the solid. Besides this, I can conceive that in the first assemblage of the particles of which this earth is composed each brought its portion of the loose heat that had been connected with it, and the whole when pressed together produced the internal fire which still subsists.

Nº. II.

A new and curious Theory of Light and Heat ; in a letter from Dr. B. Franklin to David Rittenhouse, Esq.

Read June 20, 1788. **U**NIVERSAL space, as far as we know of it, seems to be filled with a subtil fluid, whose motion, or vibration, is called light. This